Appl. No. 10/628,784

Attorney Docket No. 81940.0053

Petition to Make Special Under

Customer No.: 26021

MPEP § 708.2, VIII

# IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

| | |
|---|---|
| In re application of: | Art Unit: 2127 |
| Isamu KUROKAWA, et al. | Examiner: To Be Assigned |
| Serial No.: 10/628,784 | Confirmation No. 5212 |
| Filed: July 28, 2003 | |
| For: INFORMATION PROCESSING SYSTEM | |

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to:

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

July 28, 2004

Date of Deposit

Kimberly Yee

Name

_Kimberly Yee_ 07/28/04

Signature          Date

## PETITION TO MAKE SPECIAL UNDER

## MPEP § 708.2, VIII

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

I.      **Petition**

Applicants hereby petition to make this new application, which has not received any examination by the Examiner, Special.

II.     **Claims**

Check and complete all applicable items (a) through (c).

(a) x   All the claims in this case are directed to a single invention.

(b) x   If the Office determines that all the claims presented are not obviously directed to a single invention, Applicants will make an election without traverse as a prerequisite to the grant of special status.

III.　**Search**

    A. Check all applicable items (d) though (g)

    A search has been made by

    (d) _ the inventor

    (e) _ attorney

    (f) x professional searcher (Search Report attached hereto)

    (g) _ foreign Patent Office

in the following:

    B. Complete all applicable items below

    (h) x field of search:

| Class | Subclasses |
|-------|------------|
| 711 | 18, 133, 134, 136, 137 |

    (i) _ publications:

    (j) _ foreign patents:

    (k) _ search by corresponding foreign Patent Office or at the former International Patent Institute at The Hague, Netherlands

    C. Copy of references

    There is submitted herewith a copy of the references deemed most closely related to the subject matter encompassed by the claims. These references are also listed in the attached Information Disclosure Statement.

    D. Detailed discussion of the references

    There is submitted herewith a detailed discussion of the references which discussion particularly points out how the claimed subject matter is distinguishable over the references.

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### E. Fee

The fee required by 37 CFR 1.17 (h) is to be paid by

x   The attached check in the amount of $130.00. If there are any additional fees due in connection with the filing of this Petition to Make Special, please also charge those fees to our Deposit Account No. 50-1314.

Respectfully submitted,

HOGAN & HARTSON L.L.P.

Date:   July 28, 2004

By: _____

Sterlon R. Mason
Registration No. 41,179
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Fax: 213-337-6701

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## DETAILED DISCUSSION OF THE REFERENCES AND COMPARISON TO THE PRESENT INVENTION

### IV. Field of the Invention:

The subject matter of the above-identified application relates to controlling data look-ahead from an external storage device to a cache memory within a control device in random access input/output (I/O) request processing from a host processing device.

### V. Related Background Art:

Known data look-ahead technology that accumulates access pattern history information to predict future access patterns exits for retrieving data. Also, technology regarding optimizing the amount of data to be loaded to a cache memory is also known for retrieving data. When performing a process in which random assesses to a database are concentrated with a certain period of time, several drawbacks exist with the conventional assessed pattern history information based loading mode methods for retrieving data that include: (1) a poor sensitivity due to the random nature of the random accesses which cannot offer the optimum loading load; (2) an inability to realize a rapid improvement in the cache hit rate; and (3) a reliance on the performance (seek time + time for a disk to make one revolution + transfer time) of one hard disk drive (HDD) for responsiveness. (*See, Application, Page 1, Line 14 – Page 2, Line 20*).

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## VI.    The References:

### A.    The Yanai et al. Reference:

U.S. Patent No. 6,035,375 to Yanai et al. (hereinafter "Yanai") discloses a cache management system having a cache memory with an allocable micro-cache. According to the system disclosed by Yanai, a cache manager 10 includes a cache memory 12 and an associated cache index/directory 16. The cache manager 10 aids in buffering I/O operations received from one or more host computers 22a-22b that are directed to data storage devices 18a-18b. The cache manager 10 uses three parameters in initiating and controlling a prefetch operation. The first parameter is a threshold value that is used in determining if a current operation is a sequential access, activating a prefetch. The second parameter sets the number of data tracks to be loaded in a prefetch operation, and the third parameter determines the amount of space in the cache memory 12 to be used for the particular prefetch operation before the retrieved data tracks are written over. The parameters are dynamically altered by the cache manager 10 to optimize the performance of the system (*See, Column 7, Line 62 – Column 9, Line 21*). U.S. Patent Nos. 5,381,539 and 5,537,568, also to Yanai provide similar disclosures.

### B.    The Yochai et al. Reference:

U.S. Patent No. 6,721,870 to Yochai et al. ("hereinafter "Yochai") discloses a system that employs a prefetch algorithm for short sequences. According to Yochai, data processing system 10 includes a plurality of host computers 12a-12m that are connected with data storage system 14 by means of a controller 16. The controller 16 operates to handle I/O requests from the host computers 12a-12m directed to the data storage. Data storage system 14 includes a plurality of disk devices 18a-18k and a global memory 36, which contains cache memory 40 and tables 42 that map areas the disk devices 18a-18k to areas in the cache memory 40. The cache memory

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40 acts as a buffer to I/O operations involving the disk devices, and is provided with a short sequence prefetch process 72a that maintains a history of short sequences and uses the data in determining a dynamically adjustable expected length probability threshold 74 that is used in enabling or disabling the short sequence prefetch process 72a. (*See, Yochai, Column 2, Line 55- Column 3, Line 13; Column 4, Lines 52-59; and Column 6, Lines 24-53*).

## VII.  The Present Invention is Patentably Distinguishable Over the Cited References

### A.  One Embodiment of the Present Invention:

The present invention seeks to address the above drawbacks that exist with the conventional assessed pattern history information based loading mode methods for retrieving data. According to an embodiment of the present invention, an information processing system includes a host processing device and an external storage device that uses one or more physical devices to store data subject to I/O requests from a host processing device. The information processing system also includes a control device intervening between the host processing device and the external storage device. The control device determines whether an I/O request for a data block from the host processing device concerns a specific data space within a group of a limited number of data spaces and determines a magnitude of impact that a look-ahead processing performed at present have on other I/O requests. The control device also controls to load more data blocks than the data blocks that is a subject of the I/O request into a cache memory depending on a determination result when transferring to the host processing device the data block that is the subject of the I/O request from the host processing device.

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As described above, instead of predicting a future access pattern as conventionally taught, when it is determined that a cache memory can be occupied in response to a current I/O request and the current I/O request does not impact other I/O requests, data, including a plurality of blocks significantly larger than the block that is the subject of the I/O request are loaded to the cache memory in a single access to the HDD. Thus, an embodiment of the present invention maximizes the usage rate of resources (the cache memory and buses) by reading more data than the data required instead of predicting. Even in the random access of data, as long as the size of a database has a limit, there is a high possibility that an access would occur in the vicinity of a region previously accessed. (*See, Application, Pages 17, Lines 19*). Also according to an embodiment of the present invention, the database with the most recent I/O request or with the highest I/O frequency becomes a target of a look-ahead, thereby enhancing efficiency in terms of cache hits and in terms of memory usage efficiency. (*See, Application, Page 19, Lines 4-9*).

## B.     Distinction Over the Cited References:

The cited references do not disclose the above features of the present invention. In particular, the cited references fail to disclose or suggest the feature of "the control device [that] determines. . .a magnitude of impact that a look-ahead processing performed at present have on other I/O requests" as recited in each of the independent claims of the present application, namely independent claims 1 and 13.

The cache management system of Yanai is provided to monitor and control the contents of a cache memory couple to at least one host computer and at least one data storage device. According to the system disclosed by Yanai, a cache manager 10 includes a cache memory 12 and an associated cache index/directory 16. The cache manager 10 aids in buffering I/O operations received from one or more

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host computers 22a-22b that are directed to data storage devices 18a-18b. The cache manager 10 uses three parameters in initiating and controlling a prefetch operation. The first parameter is a threshold value that is used in determining if a current operation is a sequential access, activating a prefetch. The second parameter sets the number of data tracks to be loaded in a prefetch operation, and the third parameter determines the amount of space in the cache memory 12 to be used for the particular prefetch operation before the retrieved data tracks are written over. The parameters are dynamically altered by the cache manager 10 to optimize the performance of the system. (*See, Column 7, Line 62 – Column 9, Line 21*). Accordingly, Yanai does not disclose or suggest a control device that determines a magnitude of impact that a look-ahead processing performed at present have on other I/O requests as claimed.

The system that employs a prefetch algorithm for short sequences disclosed in Yochai is used for generating prefetch tasks for short sequences that are no longer than n track in length. According to Yochai, data processing system 10 includes a plurality of host computers 12a-12m that are connected with data storage system 14 by means of a controller 16. The controller 16 operates to handle I/O requests from the host computers 12a-12m directed to the data storage. Data storage system 14 includes a plurality of disk devices 18a-18k and a global memory 36, which contains cache memory 40 and tables 42 that map areas the disk devices to areas in the cache memory. The cache memory 40 acts as a buffer to I/O operations involving the disk devices, and is provided with a short sequence prefetch process 72a that maintains a history of short sequences and uses the data in determining a dynamically adjustable expected length probability threshold 74 that is used in enabling or disabling the short sequence prefetch process 72a. (*See, Yochai, Column 2, Line 55- Column 3, Line 13; Column 4, Lines 52-59; and Column 6, Lines 24-53*). Likewise, Yochai also fails to disclose or suggest a control device

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that determines a magnitude of impact that a look-ahead processing performed at present have on other I/O requests as claimed.

Since the cited references fail to disclose, teach or suggest the above feature recited in each of the independent claims, these references cannot be said to anticipate nor render obvious the invention which is the subject matter of these claims.
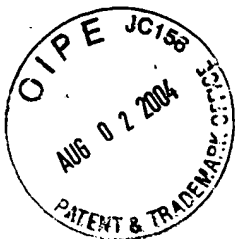
Accordingly, independent claims 1 and 13 are believed to be in condition for allowance and such allowance is respectfully requested. The remaining claims depend either directly or indirectly from independent claims 1 and 13 and recite additional features of the present invention which are neither disclosed nor fairly suggested by the cited references and are therefore also believed to be in condition for allowance.

## VIII. Conclusion

In view of the foregoing, it is respectfully submitted that the application is in condition for allowance and such action is respectfully requested.

If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is requested to call the Los Angeles, California telephone number (213) 337-6809 to discuss the steps necessary for placing the application in condition for allowance.

If there are any fees in connection with the filing of this petition, please charge the fees to our Deposit Account No. 50-1314.

# FEE TRANSMITTAL
## for FY 2004
*Effective 10/01/2003. Patent fees are subject to annual revision.*

☐ Applicant claims small entity status. See 37 CFR 1.27

**TOTAL AMOUNT OF PAYMENT** | ($) 130.00

### Complete if Known

| | |
|---|---|
| Application Number | 10/628,784 |
| Filing Date | July 28, 2003 |
| First Named Inventor | Isamu KUROKAWA, et al. |
| Examiner Name | To Be Assigned |
| Art Unit | 2127 |
| Attorney Docket No. | 81940.0053 |

## METHOD OF PAYMENT (check all that apply)

☒ Check  ☐ Credit card  ☐ Money Order  ☐ Other  ☐ None

☐ Deposit Account:

Deposit Account Number: **50-1314**

Deposit Account Name: **Hogan & Hartson L.L.P.**

The Director is authorized to: (check all that apply)

☐ Charge fee(s) indicated below  ☐ Credit any overpayments

☒ Charge any additional fee(s) or any underpayment of fee(s)

☐ Charge fee(s) indicated below, except for the filing fee to the above-identified deposit account.

## FEE CALCULATION

### 1. BASIC FILING FEE

| Large Entity Fee Code | Fee ($) | Small Entity Fee Code | Fee ($) | Fee Description | Fee Paid |
|---|---|---|---|---|---|
| 1001 | 770 | 2001 | 385 | Utility filing fee | |
| 1002 | 340 | 2002 | 170 | Design filing fee | |
| 1003 | 530 | 2003 | 265 | Plant filing fee | |
| 1004 | 770 | 2004 | 385 | Reissue filing fee | |
| 1005 | 160 | 2005 | 80 | Provisional filing fee | |

**SUBTOTAL (1)** ($)

### 2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE

| | Extra Claims | | Fee from below | Fee Paid |
|---|---|---|---|---|
| Total Claims | -20** = | X | | |
| Independent Claims | - 3** = | X | | |
| Multiple Dependent | | | | |

| Large Entity Fee Code | Fee ($) | Small Entity Fee Code | Fee ($) | Fee Description |
|---|---|---|---|---|
| 1202 | 18 | 2202 | 9 | Claims in excess of 20 |
| 1201 | 86 | 2201 | 43 | Independent claims in excess of 3 |
| 1203 | 290 | 2203 | 145 | Multiple dependent claim, if not paid |
| 1204 | 86 | 2204 | 43 | ** Reissue independent claims over original patent |
| 1205 | 18 | 2205 | 9 | ** Reissue claims in excess of 20 and over original patent |

**SUBTOTAL (2)** ($)

**or number previously paid, if greater; For Reissues, see above

## FEE CALCULATION (continued)

### 3. ADDITIONAL FEES

| Large Entity Fee Code | Fee ($) | Small Entity Fee Code | Fee ($) | Fee Description | Fee Paid |
|---|---|---|---|---|---|
| 1051 | 130 | 2051 | 65 | Surcharge - late filing fee or oath | |
| 1052 | 50 | 2052 | 25 | Surcharge - late provisional filing fee or cover sheet | |
| 1053 | 130 | 1053 | 130 | Non-English specification | |
| 1812 | 2,520 | 1812 | 2,520 | For filing a request for ex parte reexamination | |
| 1804 | 920* | 1804 | 920* | Requesting publication of SIR prior to Examiner action | |
| 1805 | 1,840* | 1805 | 1,840* | Requesting publication of SIR after Examiner action | |
| 1251 | 110 | 2251 | 55 | Extension for reply within first month | |
| 1252 | 420 | 2252 | 210 | Extension for reply within second month | |
| 1253 | 950 | 2253 | 475 | Extension for reply within third month | |
| 1254 | 1,480 | 2254 | 740 | Extension for reply within fourth month | |
| 1255 | 2,010 | 2255 | 1,005 | Extension for reply within fifth month | |
| 1401 | 330 | 2401 | 165 | Notice of Appeal | |
| 1402 | 330 | 2402 | 165 | Filing a brief in support of an appeal | |
| 1403 | 290 | 2403 | 145 | Request for oral hearing | |
| 1451 | 1,510 | 1451 | 1,510 | Petition to institute a public use proceeding | |
| 1452 | 110 | 2452 | 55 | Petition to revive - unavoidable | |
| 1453 | 1,330 | 2453 | 665 | Petition to revive - unintentional | |
| 1501 | 1,330 | 2501 | 665 | Utility issue fee (or reissue) | |
| 1502 | 480 | 2502 | 240 | Design issue fee | |
| 1503 | 640 | 2503 | 320 | Plant issue fee | |
| 1460 | 130 | 1460 | 130 | Petitions to the Commissioner | 130.00 |
| 1807 | 50 | 1807 | 50 | Processing fee under 37 CFR 1 17(q) | |
| 1806 | 180 | 1806 | 180 | Submission of Information Disclosure Stmt | |
| 8021 | 40 | 8021 | 40 | Recording each patent assignment per property (times number of properties) | |
| 1809 | 770 | 2809 | 385 | Filing a submission after final rejection (37 CFR 1 129(a)) | |
| 1810 | 770 | 2810 | 385 | For each additional invention to be examined (37 CFR 1 129(b)) | |
| 1801 | 770 | 2801 | 385 | Request for Continued Examination (RCE) | |
| 1802 | 900 | 1802 | 900 | Request for expedited examination of a design application | |

Other fee (specify) _____

*Reduced by Basic Filing Fee Paid

**SUBTOTAL (3)** ($) 130.00

## SUBMITTED BY (Complete (if applicable))

| Name (Print/Type) | Stephen R. Mason | Registration No. (Attorney/Agent) | 41,179 | Telephone | 213/337-6700 |
|---|---|---|---|---|---|
| Signature | | | | Date | 07/28/04 |